Patent Claims

1. Process for optical detection and reconstruction of surface profiles, thereby characterized, that the surfaces to be examined are illuminated from different directions with a shallow angle of incidence and therein images of the surface are prepared from a camera position with acute angle to the surface and by extraction of the contours of cast shadows on the images from light incident angle and camera position elevation profiles of structures can be determined (relief).

2. Process according to Claim 1, thereby characterized, that the camera is provided nearly perpendicular to the surface.

3. Process according to Claim 1 or 2, thereby characterized, that the light incident angle is less than 10^{o} to the surface.

4. Process according to Claim 1, 2 or 3, thereby characterized, that the cast shadows on the images are extracted by formation of quotients of light intensity values of corresponding image points.

5. Process according to Claim 4, thereby characterized, that the contours of the cast shadows are determined by means of "binary-connected-component" method.

6. Process according to one of Claims 1 through 5, thereby characterized, that also contours of bright light reflection on the images are selected and evaluated for construction of strongly tilted areas of the surface, for example a raised flank.

7. Process according to Claim 6, thereby characterized, that the contours of bright light reflection are thereby determined, that the reflected light intensity exceeds a predetermined threshold value.

8. Process according to Claims 1 through 7, thereby characterized, that supplementally light intensity distributions are evaluated according to the shape-from-shading method and employed for reconstruction of the surface structures.

9. Process according to Claim 8, thereby characterized, that in the reconstruction of the surface contours first the surface profile of the surface to be reconstructed is determined by suitable initialization by means of shape-from-shading method, that subsequently the angle between each surface element and the light incident angle responsible for the shadow image light incident direction is multiplied with a constant factor such that the average height difference on the reconstructive profile corresponds to the determined average height difference according to the above explained shadow analysis,
that in the next step as initialization by means of the shape-from-shading method a new surface profile is calculated,
and that this process is iteratively repeated until the average change of the high profile between the two sequential iteration steps is smaller than a predetermined threshold value.

10. Process according to Claim 8, thereby characterized, that in an iterative minimization in the framework of the shape-from-shading this is improved to the extent, that in the error function to be optimized a supplemental error term is added, wherein this additive term corresponds to the deviation of the from the in the previous iteration step reconstructed height profile determined height difference in the light incident direction from the by means of the shadow analysis determined corresponding height difference.

11. Process according to Claim 10, thereby characterized, that for iterization of the iterative minimization the result of the process according to Claim 9 is employed.

12. Use of the process according to one of Claims 1 through 11, for reconstruction of planetary surfaces.

13. Use of the process according to one of Claims 1 through 11, for inspection of surfaces of industrial components.